

REMARKS

The Examiner is thanked for the performance of a thorough search. By this amendment, Claims 1, 29, 61, 71 and 86 have been amended. No claims have been cancelled or added. Hence, Claims 1-89 are pending in the Application. It is respectfully submitted that the amendments to the claims as indicated herein do not add any new matter to this Application. Furthermore, amendments made to the claims as indicated herein have been made to improve readability and clarity of the claims. Applicants enclose a CD-ROM labeled as Copy 1 and an identical copy of the CD-ROM labeled as Copy 2 containing the identical contents of Appendix A as filed with the patent application on January 5, 1999. Also enclosed is substitute Page 1 of the specification which has been amended to identify the compact disc and list the file names, size, and creation date of each file.

SUMMARY OF REJECTIONS/OBJECTIONS

In the Office Action, Claims 1-89 are rejected under 35 U.S.C. 103(a) as being unpatentable over "Developing Tools for the Open Agent Architecture" by Martin¹ in view of "Information Brokering in an Agent Architecture" by Martin².

REJECTIONS UNDER 35 U.S.C. § 103(a)

CLAIMS 1, 29, 61, 71 and 86

Claim 1 recites, in part, the features:

“constructing a goal satisfaction plan, wherein the goal satisfaction plan includes:

a suitable delegation of sub-goal requests to best complete the requested service

request by using reasoning that includes one or more of domain-independent coordination strategies, domain-specific reasoning, and application-specific reasoning comprising rules and learning algorithms;”

Claim 1 has been amended to clarify that the facilitating engine uses sophisticated reasoning when delegating sub-goal requests to best complete the requested service request. The facilitating engine's use of reasoning is supported by the specification on page 10, lines 15 – 18. Amended Claim 1 requires that the facilitating engine use "reasoning that includes one or more of domain-independent coordination strategies, domain-specific reasoning, and application-specific reasoning comprising rules and learning algorithms.

For purposes of explanation, assume that the facilitator receives a request such as, "Make Coffee". The facilitator's facilitating engine uses reasoning to generate the following goal satisfaction plan:

- Sub-goal request A: Roast coffee beans
- Sub-goal request B: Grind coffee beans
- Sub-goal request C: Boil water, etc.

The facilitating engine is able to use reasoning to generate a plan to accomplish the base goal, "Make Coffee". The reasoning includes "one or more of domain-independent coordination strategies, domain-specific reasoning, and application-specific reasoning comprising rules and learning algorithms." For example, the facilitating engine uses its domain-specific reasoning based on domain-specific knowledge of symbols and axioms of the domain. In the above example, the facilitating engine uses its knowledge about domain symbols and axioms such as "coffee", "roast", and "beans" in order to generate a goal satisfaction plan by reasoning that making coffee entails roasting coffee beans, grinding coffee beans and boiling water, etc. Also, the coffee beans need to be roasted before the coffee beans can be ground and that only after the coffee beans are ground should water be boiled.

Further, the facilitating engine is able to use reasoning to delegate the sub-goals to service providing agents in such a way as "to best complete the requested service request." For example, assume that several agents are able to roast coffee. The facilitating engine is able to use

reasoning to delegate the sub-goal task of roasting coffee to the service-providing agent that can roast beans in the least amount of time because the facilitating engine has reasoned that the least amount of time taken to make coffee is the best way to accomplish the base goal of making coffee.

Similarly, to use an example taken directly from the specification (see page 21, starting at line 29 to page 22, line 1-4), the facilitating engine accomplished the request “Remind Bob about lunch” by reasoning that all available message transfer agents (e.g., fax, phone, mail, pager) are to be enabled to **compete** for the opportunity to carry out the request. In other words, the base goal is carried out not by merely parsing the request into sub-goals **based on the syntax** of the request. Rather, the facilitating engine used reasoning to decide upon using **competing** message transfer agents to reminding Bob of lunch, in lieu of delegating the task to just one message transfer agent.

In contrast, *Martin’s* “Development Tools for the Open Agent Architecture” (*Martin1*) and *Martin’s* “Information Brokering in An Agent Architecture” fail to teach the goal satisfaction plan that entails the type of reasoning described above as performed by the facilitator agent. As mentioned by the Examiner in the Office Action, *Martin’s* “Development Tools for the Open Agent Architecture” does not teach the act of constructing a goal satisfaction plan.

As for *Martin’s* “Information Brokering in An Agent Architecture” (*Martin2*), it merely discloses query processing and a query execution plan which is NOT the same as a goal execution plan. Thus, *Martin2* is merely describing a method for information retrieval rather than fulfillment of a service request. Moreover, query execution plans are well-known in database systems. In database systems, query statements are made in query languages such as SQL. SQL statements are fulfilled according to a query execution plan based on the manner in which information is stored in the database. In contrast, the goal satisfaction plan is a plan that

entails reasoning in its construction, rather than being based on the manner in which information is stored in a database.

Further, *Martin2* merely teaches that the queries are systematically broken based on syntax of the queries without any kind of reasoning for forming a goal satisfaction plan such as that of the “Make Coffee” example above. In *Martin2*, on page 11, *Martin2* teaches the construction of a query execution plan by analysis of “each predicate in the query” and the rewriting of the query for dispatch to information sources based on “a disjunction of translated subqueries. Therefore in *Martin2*, each request made of information sources **must have appeared syntactically** (albeit with language translation) **in the original query**.

Neither *Martin1* nor *Martin2*, either alone or in combination, disclose, teach, suggest or make obvious the novel features of claim 1. Thus, Claim 1 is allowable.

Claims 29, 61, 71 and 86, each contain similar features regarding the use “reasoning that includes one or more of domain-independent coordination strategies, domain-specific reasoning, and application-specific reasoning comprising rules and learning algorithms. Thus, Claims 26, 61, 71 and 86 are allowable for at least the reasons provided herein in respect to Claim 1.

CLAIMS 2-28, 30-47, 62-70, 72-85 and 87-89

Claims 2-28 are either directly or indirectly dependent upon Claim 1 and include all the limitations of Claim 1 and therefore are allowable for at least the reasons provided herein in respect to Claim 1.

Claims 30-47 are either directly or indirectly dependent upon Claim 29 and include all the limitations of Claim 29 and therefore are allowable for at least the reasons provided herein in respect to Claim 29.

Claims 62-70 are either directly or indirectly dependent upon Claim 61 and include all the limitations of Claim 61 and therefore are allowable for at least the reasons provided herein in respect to Claim 61.

Claims 72-85 are either directly or indirectly dependent upon Claim 71 and include all the limitations of Claim 71 and therefore are allowable for at least the reasons provided herein in respect to Claim 71

Claims 87-89 are either directly or indirectly dependent upon Claim 86 and include all the limitations of Claim 86 and therefore are allowable for at least the reasons provided herein in respect to Claim 86.

CLAIM 48

Claim 48 as amended, recites in part:

“the ICL having a syntax supporting compound goal expressions wherein said compound goal expressions are such that **goals within a single request** provided according to the ICL syntax may **be coupled by one or more operators from a set of operators** comprising:
a conditional execution operator; and
a parallel disjunctive operator that indicates that disjunct goals are to be performed by different agents.”

The novel method recited in Claim 48 as amended requires that “**goals within a single request**” are “**coupled by one or more operators from a set of operators**”. In amended Claim 48, the set of operators comprise, **a conditional execution operator, and a parallel disjunctive operator.**

In the Office Action, the Examiner states that “the ICL having expression which may be coupled by a conjunctive operator”. The claim has therefore been amended to clarify the applicant’s invention. It is to be noted that *Martin2* does not suggest or mention **conditional execution operator, and a parallel disjunctive operators.**

None of the cited references disclose, suggest or render obvious the requirement that the **“goals within a single request”** be **“coupled by one or more operators from a set of operators”**, such as a **conditional execution operator** (such as **“if”** and **“when”**, allowing for particular actions to be predicated on the state, or outcomes of earlier actions), and a **parallel disjunctive operator** (allowing for alternative actions to be performed at the same time, if resources allow, and a first-to-respond strategy may be used in their competition to perform the goal at hand). Claim 48 is allowable over the art of record. Thus, it is respectfully submitted that Claim 48 be held in condition for allowance.

CLAIMS 49-60

Claims 49-60 are either directly or indirectly dependent upon independent Claim 48, and include all the features of Claim 48. Therefore, Claims 49-60 are allowable for at least the reasons provided herein with respect to Claim 48. Furthermore, it is respectfully submitted that Claims 49-60 recite additional features that independently render Claims 49-60 patentable over the art of record. Thus, it is respectfully submitted that Claims 49-60 be held in condition for allowance.

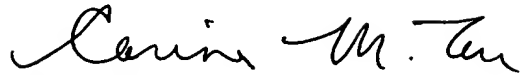
CONCLUSION

For the reasons set forth above, it is respectfully submitted that all of the pending claims are now in condition for allowance. Therefore, the issuance of a formal Notice of Allowance is believed next in order, and that action is most earnestly solicited.

If in the opinion of the Examiner a telephone conference would expedite the prosecution of the subject application, the Examiner is encouraged to call the undersigned at (650) 838-4311.

The Commissioner is authorized to charge any fees due to Applicants' Deposit Account No. 50-2207.

Respectfully submitted,
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Marked-up version

Software-Based Architecture for Communication and Cooperation Among Distributed Electronic Agents

By:

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A compact disk containing a computer program listing has been provided in duplicate (copy 1 and copy 2 of the compact disk are identical). The computer program listing in the compact disk is incorporated by reference herein. The compact disk contains files with their names, size and date of creation as follow:

| File Name | Size | Creation Date | Last Date |
|-------------|---------------|---------------|------------|
| oaa.pl | 159,613 bytes | 1996/10/08 | 1998/12/23 |
| fac.pl | 52,733 bytes | 1997/04/24 | 1998/05/06 |
| compound.pl | 42,937 bytes | 1996/12/11 | 1998/04/10 |
| com_tcp.pl | 18,010 bytes | 1998/02/10 | 1998/05/06 |

RECEIVED

BACKGROUND OF THE INVENTION

JUN 16 2003

Field of the Invention

Technology Center 2100

The present invention is related to distributed computing environments and the completion of tasks within such environments. In particular, the present invention teaches a variety of software-based architectures for communication and cooperation among distributed electronic agents. Certain embodiments teach interagent communication languages enabling client agents to make requests in the form of arbitrarily complex goal expressions that are solved through facilitation by a facilitator agent.

Context and Motivation for Distributed Software Systems

The evolution of models for the design and construction of distributed software systems is being driven forward by several closely interrelated trends: the adoption of a *networked computing model*, rapidly rising expectations for *smarter, longer-lived, more autonomous software applications* and an ever increasing demand for *more accessible and intuitive user interfaces*.

Prior Art Figure 1 illustrates a *networked computing model* 100 having a plurality of client and server computer systems 120 and 122 coupled together over a physical transport mechanism 140. The adoption of the *networked computing model* 100 has lead to a greatly increased reliance on distributed sites for both data and processing resources. Systems such as the networked computing model 100 are based upon at least one physical transport mechanism 140 coupling the multiple computer systems 120 and 122 to support the transfer of information between these computers. Some of these computers basically support using the network and are known as *client*